PATENT SPECIFICATION

618,388

Convention Date (United States of America): Nov. 1, 1945.

Application Date (In United Kingdom): Nov. 1, 1946. No. 32469/46.

Complete Specification Accepted: Feb. 21, 1949.

13 April 1949

Index at acceptance:—Class 80(i), A(2bx: 3).

COMPLETE SPECIFICATION

Improvements in or relating to Threaded Fastening Devices of the Self-Locking Type

We, ELASTIC STOP NUT CORPORATION OF AMERICA, a Corporation organized under the Laws of the State of New Jersey, United States of America, of 2330, Vauxhall Road, Union, State of New Jersey, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to threaded fastening devices of the self-locking type, and more particularly to such devices in the form of cap nuts, that is, nuts provided with an end cover or cap for masking the end of the element on which the nut is threaded.

While the invention finds its most extensive application when embodied in the form of a nut and will hereinafter be described as applied to a nut, it will be understood that the scope of the invention is not limited to nuts but may include other articles.

The primary object of the invention is to provide a new and improved form of threaded self-locking device and in particular of a cap nut or like member.

The invention includes that improvement in a threaded fastening device of the self-locking type comprising a body member having a threaded bore extending therethrough and a recess at one end of the threaded bore and an insert of elastic material fixed in said recess and having a bore located so as to be traversed by a threaded element screwed through the threaded bore and to have a thread impressed therein by said element, which consists in providing the insert with an integral cap portion closing one end of the threaded bore to provide a self-locking cap nut or like member.

More specifically the threaded fastening device of the self-locking type according to the invention comprises a body member having a threaded bore therethrough and a recess at one end of the threaded bore, the recess being encircled by an annular flange constituting an integral part of said body member, an insert of elastic plastic material comprising a cap portion for closing one end of said bore and a depending annular portion located in said recess, the annular portion having an annular external shoulder thereon and the free end of said flange being inturned over and into engagement with said shoulder to secure the insert in said recess and to provide a seal between the insert and said body member, the insert having a bore located to be traversed by a threaded element screwed through said threaded bore and to have a thread impressed therein by said element.

The invention will be hereinafter more particularly described with reference to the accompanying drawings forming a part hereof and in which:—

Fig. 1 is a longitudinal central section through a nut embodying the invention;

Fig. 2 is a plan view of the nut shown in Fig. 1;

Fig. 3 is a perspective view of one of the parts of the nut shown in Fig. 1;

Fig. 4 is a fragmentary section showing the working end of a punch suitable for assembling the nut shown in Fig. 1; and

Fig. 5 is a view similar to Fig. 1 showing a different form of nut embodying the invention.

Referring to the drawings, the nut illustrated is of the usual hexagonal form and comprises a main metal body 10 which may be of steel, brass or other suitable metals or alloys. The body 10 is provided with the usual wrench-engaging external flats 12 and is further provided with a bore 14 having an internal thread 16. At its base the nut is also provided with the usual counterbore 18 to facilitate entry of the element on which the nut is to be screwed.

The top portion of the body 10 is turned

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or otherwise formed to provide an axially extending annular flange 20 which provides a wall surrounding an annular recess 22 formed by a counter bore in the upper end of the nut body. The base of the recess 22 may be slightly conical as shown or flat.

Seated in the recess 22 is a cap member or insert indicated generally at 24. This insert comprises a cap portion 26 from which depends an annular locking portion 28 having a bore 30 aligned with the bore 14 in the body of the nut. Exteriorly, the cap portion is advantageously of dome-like configuration and at the base of the cap portion there is provided an external annular shoulder 32. The internal bore 30 is advantageously carried upwardly to extend beyond the level of the shoulder 32.

In the embodiment shown, the insert is locked and sealed in the body by inturning the upper or free end of the flange 20 over the shoulder 32 to form a retaining lip or rim 34 which operates to compress and clamp the insert in the recess against axial displacement. This operation may be performed by known methods, advantageously by a punch press operation with known forms of closing punches, such as that indicated at 36 in Fig. 4. In many instances, the axial compression resulting from the closing operation may be sufficient to insure against turning of the insert in the nut body when the nut is applied, but in other cases it may be desirable when the recess in the nut body is circular to provide additional means for insuring against turning of the insert. This may readily be accomplished by providing the closing punch 36 with one or more projections 38 for indenting the lip 34 at peripherally spaced places to provide studs 40 which penetrate the shoulder 32 of the insert, one of such studs being indicated by dotted lines in Fig. 1. Ordinarily, because of manufacturing advantages, it is desirable to have the recess in the nut body and the outer periphery of the insert circular, but obviously insofar as the present invention is concerned they need not necessarily be of such configuration and it is accordingly to be understood that the term "annular" as employed herein and in the appended claims is used in its broader sense and intended to include forms in which the periphery may not be truly circular.

The bore 30 of the insert is preferably unthreaded although it may have, in the case of relatively large size bores, a partial thread impressed therein for reasons hereinafter explained.

The material of which the insert is made is of elastic, plastic nature and is preferably, in accordance with the invention, formed of a mouldable homogeneous plastic material of which a most satisfactory example is that commercially known as nylon. In addition to the qualities of elasticity and plasticity which nylon possesses and which make it a highly satisfactory material for the purpose of producing the required locking action, nylon also has exceptionally good resistance to chemicals, moisture, heat and atmospheric changes, and these latter properties are highly desirable in a device of the kind under consideration where a large area of the insert material is exposed after the nut is applied, in contrast to the ordinary nut having an open locking collar which is substantially entirely enclosed between the nut body and the bolt after the nut is applied. The invention is, however, not limited specifically to the use of nylon since other thermoplastic and thermosetting plastic materials may also be utilised. Such materials may include plasticised cellulose derivatives and resins and the invention further does not exclude the employment of plastics which may include filler material and/or colour in the substantially homogeneous plastic mass.

The nut when secured on a threaded element, such as a screw, bolt, or externally threaded tube or conduit, operates to lock itself thereon against vibration by the gripping action of the elastic material in which a thread is impressed by the end of the threaded element which has first passed through the threaded body of the nut and is advanced by the previously engaged threads so as to traverse the bore 30 of the insert and impress a thread therein. This action involves plastic flow of the material of the insert and elastic compression, the retaining wall 20 of the nut body 40 providing reinforcement insuring against splitting of the insert due to the force tending to expand it when the thread is impressed. When the nut is removed, the elastic properties of the insert material provide an appreciable degree of elastic return or spring-back of the material toward its original form so that when the nut is re-applied, the material is recompressed and adequate elastic locking action retained. With very large sizes of bores and threads, the displacement required to compress a full depth thread in the unthreaded bore of the insert, which is ordinarily approximately equal to or slightly smaller than the pitch diameter of the thread, may require the application of an undesirably high torque when the nut is applied for the first time. In such instances, the insert may have a

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partial depth thread formed in it to reduce the extent of displacement of material required when the nut is first applied but in no case is the insert formed so that the threaded element can traverse it without causing appreciable displacement of material, which is required in order to secure the desired locking action.

Self-locking nuts have heretofore been produced in which the locking action is secured by means of an annular open collar of elastic material, such as compressed fibre, and it has also been proposed to form self-locking cap nuts by means of a three-piece construction involving the use of a nut body, an open locking ring or collar and a separate metal cap or closure overlying the collar.

Cap nuts formed in the above-described manner are subject to a number of deficiencies which the present invention eliminates. In the first place, one of the primary considerations in the production of articles of the kind under consideration effects a considerable saving as compared with the prior cap nut constructions since there are fewer parts to be fabricated and the assembly operation is much simpler and speedier than in the case where three separate elements have to be assembled. Also, it has been found that in the previous type of construction, corrosion may occur due to electrolytic or other corrosive influence at the joint between the body and cap of a metal-capped nut. This difficulty is eliminated by the present construction. In numerous instances, cap nuts are desired for blanking or sealing the ends of conduits containing fluid under pressure and it has been found that nuts made in accordance with the present invention are capable of sealing such elements against relatively very high gaseous pressures of the order of the usual line pressure employed for compressed air in shops and the like where the pressure may be of the order of one hundred pounds per square inch. Against the pressure of liquids the seal has been found to be effective against very much higher pressures.

The formerly proposed three-piece construction, involving a metal to metal joint between the cap and the closing rim of the nut body, has proved to be wholly inadequate from the standpoint of providing a seal against fluid pressures of any appreciable magnitude. Likewise, this tight seal which is obtained by the present construction enables these nuts to be successfully utilised in applications where it is desirable to protect the bolt or other threaded element on which the nut is screwed from the corrosive influence of an ambient atmosphere or fluid to which the nut may safely be exposed because of the nature of its surface and to which the element on which it is screwed cannot be exposed because of the nature of the material.

In some instances, it may be desirable to provide a recess at the inner end of bore 30, as by the annular bore 42 shown in Fig. 5, for the purpose of limiting the length of the locking section of the bore in which a thread is impressed to substantially the zone in which the insert is radially confined and supported by the nut body.

The plastic materials which have been found most suitable for use in carrying out the invention can readily be produced in transparent or highly translucent form which provides advantage in certain kinds of installation since the extent to which the nut has been threaded onto its companion element can readily be observed. By carrying the bore, whether recessed or not, well up into the cap beyond the shoulder 32, not only is an adequate length of bore obtained to insure proper locking action but also where transparent caps are used, it can visually be established that the nut is fully applied. In some cases where opaque caps are used, it may inadvertently be attempted to screw the nut on too far but with the materials contemplated by the invention for use in the insert, it has been found that the elastic nature of the material will cause the cap under such circumstances to stretch materially without breaking so that the operator applying the nut is warned by the torque and/or by visual observation of the extension of the cap that the nut is seated, before damage is done.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A threaded fastening device of the self-locking type comprising a body member having a threaded bore therethrough and a recess at one end of the threaded bore, an insert of elastic plastic material comprising a cap portion for closing one end of said bore and a depending annular portion fixed in said recess, said insert having a bore located to be traversed by a threaded element screwed through said threaded bore and to have a thread impressed therein by said element.

2. A device according to Claim 1, in which the insert is formed of a substantially homogeneous elastic plastic material.

3. A device according to Claim 1 or 2, in which the insert consists of mouldable thermoplastic elastic material.

4. A device according to any of Claims

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1 to 3, in which the insert consists of nylon.

5. A threaded fastening device of the self-locking type comprising a body member having a threaded bore therethrough and a recess at one end of the threaded bore, the recess being encircled by an annular flange constituting an integral part of said body member, an insert of elastic plastic material comprising a cap portion for closing one end of said bore and a depending annular portion located in said recess, the annular portion having an external shoulder thereon and the free end of said flange being inturned over and into engagement with said shoulder to secure the insert in said recess and to provide a seal between the insert and said body member, the insert having a bore located to be traversed by a threaded element screwed through said threaded bore and to have a thread impressed therein by said element.

6. A device according to Claim 5, in which the bore in the insert extends axially into the cap portion thereof beyond the external shoulder.

7. A device according to any of Claims 1 to 4, in which the insert is of substantially transparent elastic plastic material and is formed so that the cap portion thereof extends axially beyond the portion of the insert located in the recess of the body portion with the bore of the insert extending axially into the cap portion.

8. A device according to Claim 1, 2 or 3, in which the bore of the insert is formed with a radially enlarged portion extending into the cap portion thereof.

9. A device according to Claim 5, in which the insert is formed with a bore providing firstly a locking section located adjacent the end of the threaded bore and confined within the recess and threaded to be traversed by a threaded element screwed through the threaded bore and to have a thread impressed therein and secondly a radially enlarged portion in the cap portion of the insert extending beyond the bore.

10. An insert for self-locking cap nuts and the like consisting of an integral body of elastic plastic material capable of having a thread impressed therein, said body comprising a cap portion for forming a closure and an annular portion extending therefrom, said annular portion having an external peripheral shoulder for engagement with the body in which the insert is fixed and providing an unthreaded bore for impression therein of a thread.

11. An insert according to Claim 10 in which the shoulder is located nearer the open end of the insert than is the inner end of the bore.

12. An insert according to Claim 10 or 11, which consists of an integral body of substantially transparent elastic plastic material capable of having a thread impressed therein.

13. An insert according to any of Claims 10 to 12, which consists of an integral body of nylon.

14. An insert as claimed in any of Claim 10 to 13, in which the body is formed with a bore providing a locking section at the outer end of the bore for impression therein of a thread and with a radially enlarged or recessed section in the cap portion of the insert.

15. A threaded fastening device of the self-locking type constructed substantially as described with reference to Figs. 1, 2 and 4 or Fig. 5 of the accompanying drawings.

16. An insert for cap nuts or the like constructed and arranged substantially as described with reference to Fig. 1 and 3 or Fig. 5 of the accompanying drawings.

Dated this 1st day of November, 1946.

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Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1949.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 2s. 0d. each (inland) and 1s. 6d. (abroad) may be obtained.

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618,388 COMPLETE SPECIFICATION

1 SHEET

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

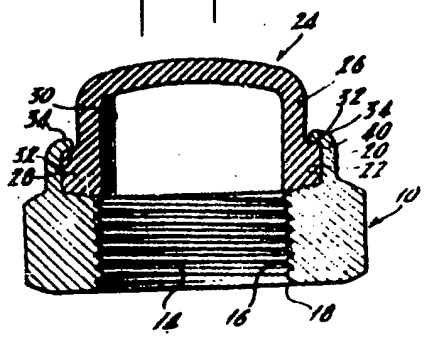


Fig. 3.

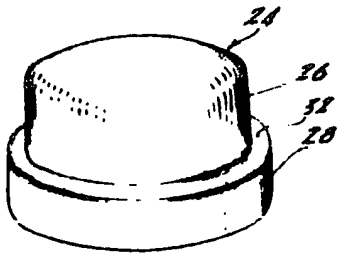


Fig. 2.

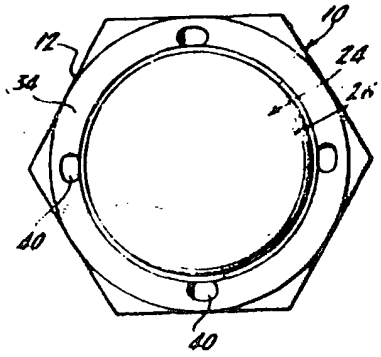


Fig. 4.

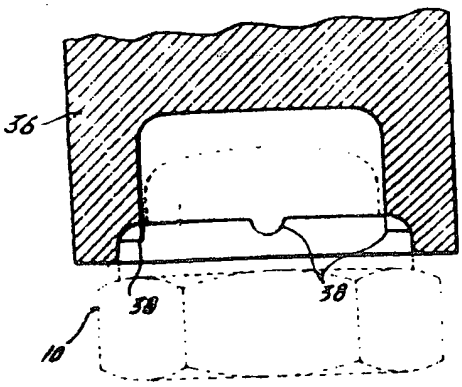
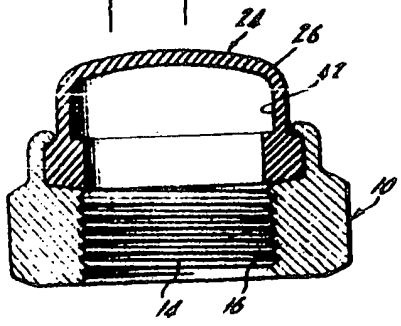


Fig. 5.



H.M.S.O. (Ty. P.)

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